

WPS 2400

POLICY RESEARCH WORKING PAPER

2400

Child Care and Women's Labor Force Participation in Romania

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In Romania both the maternal decision to take a job and the decision to use out-of-home care are sensitive to the price of child care as well as to the potential market wage of the mother. A decrease in the price of child care can increase the number of mothers in the labor force and thus reduce poverty in some households.



Summary findings

Fong and Lokshin model the household demand for child care, the mother's participation in the labor force, and her working hours in Romania. Their model estimates the effects of the price of child care, the mother's wage, and household income on household behavior relating to child care and mothers working outside the home. They find that:

- Both the maternal decision to take a job and the decision to use out-of-home care are sensitive to the price of child care. A decrease in the price of child care can increase the number of mothers who work and thus reduce poverty in some households.
- The potential market wage of the mother has a significant positive effect on the decision to purchase

market care and the decision to engage in paid employment.

- The level of household nonwage income has little effect on maternal employment and the demand for child care.

In addition to facilitating women's work, kindergartens and crèches appear to provide educational and social benefits for children. Close to half the children in these facilities have mothers who do not work.

Further research is needed to assess the cost and nature of these benefits and to determine the appropriate roles for the private and public sectors in providing, financing, and regulating such services for working and nonworking mothers.

This paper—a product of Poverty and Human Resources, Development Research Group—is part of a larger effort in the group to understand the role of gender in the context of the household, institutions, and society. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Patricia Sader, room MC3-632, telephone 202-473-3902, fax 202-522-1153, email address psader@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. Michael Lokshin may be contacted at mlokshin@worldbank.org. July 2000. (30 pages)

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CHILD CARE AND WOMEN'S LABOR FORCE PARTICIPATION IN ROMANIA

by
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Keywords: Romania, Eastern Europe, Labor supply, Child care, Maximum likelihood, Non-parametric estimations

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1. Introduction

The research in this paper addresses the problems faced by families with children in a transitional economy and the impact that reforms in the child care system can have on the well-being of children and the employment of women in Romania. Early childhood development programs have been shown to have substantial physical health, nutrition, and family benefits as well as major cognitive and social benefits for children. A large body of research from diverse cultures provides strong evidence that most early childhood development programs of relatively good quality have meaningful short-term effects on cognitive ability, early school achievement, and social adjustment (Reynolds et al. 1997).

Ensuring healthy child development is not only an investment in a country's future workforce and economic capacity, but it is also an important mechanism for making use of the human capital vested in women of working age. In addition, the provision of child care services facilitates women's employment and can reduce economic disadvantages for women and their children by increasing their income. A better understanding of child care choices and their effects on women and children in different socioeconomic groups is therefore needed to inform policy discussions on female employment and child care in the context of the economic transition.

In the pre-transitional period women in Romania, as in other Communist countries, participated in the labor force on a level higher than in industrialized market economies. Romanian women also worked full-time the whole year round, and there was very little part-time employment. Despite a decline of 12 percent since 1990, the rate of women's labor force participation remains relatively high in Romania, and averaged over 75 percent for women of ages 25-49 in 1997 (Cace et al.)

Such a high level of involvement of women in the economy would not have been possible without the existence of a wide range of government-subsidized child care programs, in the form of crèches, kindergartens, and after-school programs. Under central planning government resources were devoted to providing appropriate care for children in center-based programs from the earliest months of life until they entered primary school.

The fundamental restructuring of the economic system toward a market economy that started in 1989 led to dramatic changes in Romania's socioeconomic environment and strained the existing system of social protection and state-subsidized institutions. A more than 26 percent drop in gross national product (GNP) from 1989 to 1994 (Milanovich 1997) resulted in a widening budget deficit, shrinking government programs, and an erosion of family subsidies (child benefits and child care allowances). Between 1989 and 1997, child benefits were reduced to 65 percent of their pre-transition levels (Zamfir 1998).

Most countries in the region have seen a decline in preschool child-care services during the transition. In Romania public child care services declined in quality and parents were asked to carry a larger share of the cost already in the last decade of the socialist regime. Responsibility for crèches for children ages 0-2 has been removed from enterprises and transferred to the Ministry of Health, while kindergartens for ages 3-6 remain the responsibility of the Ministry of Education. The number of crèches declined from 847 in 1989 to 573 in 1995, and the enrollment of children (2 months to 3 years of age) in crèches dropped by half. At the same time, new legislation (law 120/97) provided 65 percent of her previous salary to a mother who wished to care for her child during its first year of life. This was recently extended to age two, and many mothers working in the public sector prefer to stay home on child-care leave when children are young.

The number of children (3-6 years old) in kindergartens has declined by nearly one third since 1989 (Zamfir 1998). According to UNICEF (1997) the proportion of children in kindergartens dropped from 63.3 percent in 1989 to 55.1 percent of relevant population in 1996. Although attendance has declined, the growth of private institutions has afforded greater choice in kindergartens.

Kindergarten fees doubled in relation to the average wage in 1990 but have since declined roughly to the pretransition level of 10 percent (Fong 1996). Fees are subsidized, and users currently pay about 51 percent of the total cost of keeping their children in child care facilities. (Zamfir, 1999) For some households, particularly single-parent households, the unemployed, and those subsisting on pensions, the fees for child care may nevertheless present a serious problem.

Until recently, there has been little research on the economics of child care outside of the United States. In recent years a certain amount of research on child care has been conducted in the nations of Western Europe, where (as in the United States) growing numbers of women with young children have been entering the workforce (see, for example, Gustafsson and Stafford, 1992;

Cleveland, Gunderson and Hyatt 1996; Van Den Brink and Groot 1997). To date only a very limited amount of research has been conducted on child care and women's labor market activity in transitional economies. Lokshin (1999) has investigated the effects of the price of child care, the mother's wage, and household income on household behavior and well-being in Russia.

The research reported in this paper is prompted by the complexity of the problems faced by families with children in the transition and by the significant impact that reforms in the child care system can have on the political and economic environment, and on the well-being of future generations in Romania. Where child care represents an important mechanism to overcome social inequality experienced by women and children, a better understanding of child care choices and their effects on women and children in different socioeconomic groups can serve to inform policy discussions about the contexts in which economic changes enhance or compromise child development. Based on recent progress in the theory of demand for child care and women's labor supply in the United States, this paper follows the work of Blau and Robins (1988), Ribar (1992, 1995), Connelly (1992), Michalopoulos, Robins, and Garfinkel (1992), Kimmel (1995), Averett, Peters, and Waldman (1997) in jointly modeling households' decisions about child care and mothers' decisions about entering the workforce. The research is based on household survey data from the Romanian Child Care and Employment Survey (RCCES) and data on child care providers from the Romania Child Care Facilities Survey (RCCFS). These two surveys were conducted by the World Bank in the same geographical areas during the same time period and were designed to allow matching data on child care fees and child care quality collected from kindergartens and with the households surveyed in the same communities.

The paper is organized as follows: Sections 2 and 3 describe the data and present descriptive statistics on the main factors that influence household behavior. Subsequent sections show the development of the theoretical model, give details of the empirical model, discuss the conceptual issues involved in estimating a consistent model of household child care choice and labor supply. This is followed by a presentation of the results, and an analysis of the estimation results and simulations in Section 6. A discussion of the policy implications and a summary of the findings conclude the paper.

2. Data and Variables

This research is based on data from the Romania Child Care and Employment Survey (RCCES) conducted by the World Bank in April 1999. The nationally representative sample contains information on 1,505 households with children younger than 12 years of age, and 403 households with children of age 0-6 in kindergartens and/or crèches.

The initial sample of households for the survey was identified from a stratified three-stage, multistrata sample of residential addresses. In the first stage, the total sample was proportionally divided into several subsamples, using two strata based on the region (11 regions) and the size of the locality (rural, small town with population under 50,000, medium-size town with population 50,000-200,000, large town with population over 200,000; and Bucharest). In the second stage, the geographical area units were randomly selected within each subsample. In the third stage, households in the area units were selected using a random route (maximum of 10 households per sampling point).

The data set includes information on the individual members of these households, household-specific information, and community-level data. It also contains information on the child care arrangements made for each child in the household, the amount of time spent by each child in formal and informal child care, and the amount of money paid for formal child care during the week of the survey. The part of the questionnaire administered to each member of the household yields data on how much time each household member spent looking after children and was active in the labor market, as well as information on their monthly wages. The second part of the questionnaire, administered to one respondent per household on matters that affected the household collectively, yields information on non-wage household income and on household composition.

Parallel to the household survey, a Romanian Survey of Child Care Facilities (RCCFS) collected information about 316 kindergartens and crèches that were attended by the children from the household sample interviewed by RCCES. The questionnaire, which was administered to every facility manager, provides detailed information on fees and types of care. With these surveys it is possible to match households with the child care prices they face in the area in which they live and purchase care.

3. Descriptive Statistics

Child care facilities

The system of preschool care in Romania is regulated by Government Decision (Romanian Government 1991). According to this regulation kindergartens and nurseries should provide, free of charge, children's medical assistance, instruction, and education, with the required expenses covered by the budget of the state central administration.

Parents contribute up to 75 percent of the cost of food for children in child care. Their monthly contribution is set as a percentage of total monthly household income, adjusted by the number of children the household has enrolled in the child care facility. Fees are calculated according to three income brackets. Households with total gross income below 12,000 leis (in 1991 prices) pay 50 percent of the total fee for the first and 40 percent for the second child in the facility. Parents with income between 12,000 and 20,000 leis pay 75 and 55 percent of the fee for the first and the second child. Finally, households with total income above 20,000 leis pay the full fee for the first child and 70 percent of fee for the second.

The average fee per-child in the daily program was 173,300 leis per month for the households surveyed. In some facilities parents are also required to pay for the development and academic activities provided. In our sample, 54 percent of child care facilities managers reported that they charge for such activities and that the amount of this additional fee is about 20 percent of the base fee.

Since 1989 there has been a decline in the use of state-provided child care facilities, which has led to underutilization of kindergartens and crèches. Table 1 shows the occupancy rates i.e. the ratio of the facility capacity to the actual number of children enrolled in the program. These occupancy rates are lower than the numbers from other sources. For example, Evans et al. (1995) reports an occupancy rate of 94 percent at the end of 1993. This discrepancy may indicate that enrollment in child care facilities in Romania is falling faster than the decrease in the number of kindergartens or crèches.

Household child care arrangements

Placing children in child care in Romania is common practice, whether the mother is working or not. About half of the children in the sample were in formal child care, half at home (Table 2). For formal child care, however, more than half of the child care places went to children whose mothers were not working. In other words, formal child care is used as both to allow the mother to work outside the home, and as a benefit in its own right for the child. For women who work, however, child care remains an important factor in allowing them to work, and 62.9 percent of working mothers put their children in formal child care, while 37 percent still keep the child at home.

The dual function of child care to allow mothers to work and to benefit pre-school children is also evident if we look at the role of other members of the household (Table 3). The presence of other relatives in the household influences the choice of child care. Of the 81.0 percent of working mothers with other household members who were at work, over 50 percent put the children in child care and the remaining 31 percent kept them at home. When other household members do not work, child care is still used as a benefit for the child, and twice as many of these households put children in child care as keep them at home.

This dual function becomes especially clear for households with many children. For mothers who do not work, those with one child are more likely to keep the child at home than put it in child care. Those with two or more children, however, are slightly more likely to put them in formal care than to keep them at home. (Table 4).

Mother's labor force participation

The level of mothers' labor force participation declines with household size. For example, in the households of two (single mother family) or three (single mother with two children or two adults with one child), about 42 percent of mothers work. This number declines to 32 percent for the households with five family members and falls even further for larger households (Table 5).

A possible explanation for this pattern is that the mother's decision to participate in the labor market is determined by the total household income. Large households have higher total income, and thus the potential contribution from the mother's wage income to total household income is relatively

lower than that contribution in smaller households. Large households more often can find it optimal for the mother to stay home with children and thus to provide better-quality care and perhaps other domestic services as well than households with fewer members.

The decision for mothers to work also depends on the number of children in the household. Among households with more children, the advantage of the mother's staying home is higher than for households with only one child. Table 6 presents the proportion of households with working mothers by the number of children. Mothers' productivity at home increases with the number of children in the household relative to their productivity in the labor market because of economies of scale that can exist in home-provided care. For households with only one child, more than 40 percent of mothers work. For households with 2 and 3 children, the proportion of mothers in the labor force drops to about 30 percent, and this proportion declines to 20 percent for households with four or more children.

A special section of the RCCES questionnaire was devoted to questions about mothers' own perceptions of child care and its effects on maternal employment. Among mothers of small children in Romania, 65.5 percent say the price of child care influences their decision to work or not to work. Only a little more than one-third of the mothers consider the lack of kindergartens and crèches an obstacle to employment, however. When asked about the major factors that influence the decision to put their children in kindergarten, mothers report that the quality of care provided and the convenience of the facility's operating hours are the most important. At the same time, 20 percent of Romanian households with small children would not use formal child care arrangements even if they were free.

4. Theoretical Model

The analysis applies to households with children under 7 years of age. Three forms of child care are available to households in Romania:

- informal (home provided and free) care provided by the mother
- informal child care provided by other household members
- formal (government or market provided) child care

For households with children and two parents, the husband is considered a potential provider of free child care. In a household with a single mother who has no relatives living with her, it is assumed that

any informal child care is provided by children themselves or relatives who live outside the household.

We classify child care arrangements into six categories defined by combinations of the mother's employment status, mode of care (formal and informal), and employment status of other household members (Table 2).

The theoretical model used in this paper is based on the assumption that household members make choices about their consumption of child care quality, of market goods, and of leisure. A household's decisions about the quality of child care it wishes to obtain and about the amount of time each member of the household can work are motivated by the desire to achieve the highest level of household welfare.

We also assume that households pay a flat fee for child care services. The fees charged by kindergartens are a function of the quality of care provided by the facility and the total level of child care prices within the locality. This important assumption needs further explanation.

As we noted, how much Romanian households are charged for child care depends on total household income. Parents of children attending the same kindergarten can pay different fees. Thus, the prices of child care are endogenous to household behavior and in particular to the household members' labor supply decisions. Certain households may decide not to send their mothers to the labor market because this would increase their income and put such households into a higher child care price bracket. The endogeneity of child care prices complicates the model substantially.

There are two ways to deal with the problem. We could estimate the structural model of household behavior with a kinked budget constraint under an assumption of endogeneity of prices of child care, or we could ignore the fact that households with different incomes pay different prices for child care and assume that every household whose children attend the same kindergarten pays the same flat fee.

Estimating the correct structural model under assumptions of a kinked budget constraint is complicated. Even in simple cases, using the instrumental variables for identification may be criticized on the basis of invalid exclusion restrictions. At the same time, ignoring the differences in fees paid by households would introduce measurement errors in our estimation.

Most of the recent literature on child care treats the price of child care as exogenous. The assumption of exogenous child care prices may underestimate the effect of child care prices on poor

Romanian households. Yet despite the disadvantages of the simpler method, we still choose it over the more complicated estimation of the structural model, as the ability of such a model to provide any additional insights has yet to be established. In this paper we identify the effect of changes in the price of care through the regional differences in child care fee levels.

In the one-period utility maximization problem the household chooses its consumption of a Hicksian composite good G , the average per-hour quality of child care Q , the leisure time of the mother L_m and the leisure time of other household members L_o subject to its budget and time constraints. The household utility function is assumed to be twice-continuously differentiable and quasi-concave:

$$\text{Max } U = U(L_m, L_o, G, Q). \quad (1.1)$$

The total quality of child care Q is the weighted sum of the exogenous quality of the child care provided by the mother Q_m , the quality of child care purchased on the market Q_p , and the exogenous quality of child care provided by relatives Q_o :

$$Q = Q_m L_m + Q_p (H_m - T_o) + Q_o T_o. \quad (1.2)$$

The budget constraint includes total household expenditures on child care as a function of the number of children in the household, of the per-unit quality price of child care, of the quality of formal care, and of the time spent by the children in care:

$$G = E + W_m H_m + W_o H_o - N P_q Q_p (H_m - T_o), \quad (1.3)$$

where E is the exogenous nonwage household income, H_m is the mother's actual work time, H_o is the other household members' actual work time, N is the number of children in the household, P_q is the exogenous price per unit of quality of formal child care, T_o is the amount of time spent by other household members on child care, W_m is the market wage available to the mother, and W_o indicates the market wage available to the other household members.

Finally, the model specifies – under the assumption that children require constant care – the time constraints affecting the mother, the other household members, and the children:

$$L_m + H_m = L_o + H_o + T_o = 1 \quad (1.4)$$

$$H_m - T_o \geq 0 \quad (1.5)$$

$$0 \leq T_o, H_o, L_o, L_m, H_m \leq 1 \quad (1.6)$$

The household optimizes the labor supply of its members, chooses the optimal quality of child care for each of the six possible child care/employment mode states, and then chooses the state with the highest utility.

5. Empirical Model

The empirical model used in this paper consists of a discrete choice equation for the child care mode and mother's labor supply, an equation for a mother's hours at work, and an equation for children's hours in paid care.

For the discrete choice model, the utility that the i th household derives from the choice of the j th discrete alternative can be expressed in linear form as:

$$\Omega_{ij} = \overline{\Omega}_{ij} + \varepsilon_{ij} = X_i\beta_j + Z_{ij}\gamma_j + \varepsilon_{ij} \quad j = 0, \dots, 5 \quad (2.1)$$

where Ω_{ij} is the utility for household i choosing state j , X_i is the vector of the household characteristics that affect the choice of the i th household and that do not vary by state, Z_{ij} is the vector of outcome-specific variables, β and γ are vectors of unknown parameters, and ε_{ij} is a random disturbance that reflects, among other things, unobservable attributes of the alternatives. The probability that household i chooses state j is then:

$$\begin{aligned} \Pr_i(j) &= \Pr[\Omega_{ji} > \Omega_{qi}] && \text{for any } j \neq q] \\ &= \Pr[\varepsilon_{ji} - \varepsilon_{qi} > X_i(\beta_{qi} - \beta_{ji}) + Z_{ij}(\gamma_{qi} - \gamma_{ji})] && \text{for any } j \neq q] \end{aligned}$$

The supply function for mother's hours at work and the demand function for hours spent by children in formal care can be specified in linear form as:

$$H_i^k = \alpha^k X_i + \varphi^k Z_i + \xi_i^k, \quad \text{where } k = \begin{cases} 1 & \Rightarrow \text{hours mother works} \\ 2 & \Rightarrow \text{hours children spend in paid care} \end{cases} \quad (2.2)$$

Here, H_i^k is the continuous dependent variable k associated with household i in state j . In the first continuous outcome equation, H_i^1 is the number of hours that a mother supplies to the labor market (if she works), and H_i^2 is the number of hours spent by children in formal child care facilities in those states where formal child care arrangements have been chosen. X_i and Z_i are the vectors of the variables defined above, α^k and φ^k are vectors of unknown parameters, and ξ_i^k is an error term with mean zero.

The theoretical model assumes that a household makes simultaneous decisions about the mode of child care it wishes to use, the labor supply of each of its members, the amount of time that each family member spends on child care, and the amount of time that their children spend in formal care. All of these decisions are determined by exogenous characteristics of the family and individual family members, both observable and unobservable.

Several estimation issues need to be discussed. First, the error terms in the discrete (ϵ) and continuous (ξ^k) equations may be correlated across states and among each other. The correlation across states is a correlation among disturbances in the state-specific indirect utility functions (e.g., 2.1). If, for instance, a mother's participation in the labor force is determined by, among the other factors, some unobservable taste for work, this unobserved factor will be part of ϵ_{ijt} for states in which the mother is employed ($j = 2, \dots, 5$). There may be a correlation between the disturbance in the equation for a household's choice of discrete states and the equation for the amount of time that women supply on the labor market. Similar correlations can exist for the equations that determine the following: (i) labor supply decisions of the other family members, (ii) time spent on child care by the mother and the other family members, and (iii) household child care arrangements.

To account for possible error correlations in a tractable way, we impose a factor structure on the disturbances in equations (2.1) and (2.2):

$$\epsilon_{ij} = \mu_{ij} + \rho V_i; \quad \xi_i^1 = \lambda_i + \tau V_i; \quad \xi_i^2 = \gamma_i + \varsigma V_i \quad (3.1)$$

where μ_{ij} is an independent extreme value error, and λ_i , and γ_i are independent normal random variables. V is a factor. This factor is unobservable variables that influence the choices made by households and that is uncorrelated with the explanatory variables. ρ , τ , and ς are factor loadings that represent the effect of the factor V in each equation.

The system of equations (2.1-2.2) with the error structure (3.1) can be estimated by the Semi-Parametric Full Information Maximum Likelihood (SPFIML) method developed by Laird (1978) and Heckman and Singer (1984) and applied to simultaneous equations by Mroz and Guilkey (1992) and Mroz (1999).

The above specification assumes that each household has the same choice set of child care arrangements and labor force participation modes. However, a significant proportion of Romanian families do not consider formal care a possible care alternative for their children. The RCCES asks whether households would consider putting their children in formal care if the care were free and of

better quality. One-fifth of the households with small children answered that they would not send the children to formal child care facilities. For these groups of families, the conditional contribution of the discrete outcome equation to the likelihood function is calculated based on a restricted set of possible forms of care, i.e., that there are no formal care arrangements in the choice set of these households (equations 5.1 and 5.2):

<p style="text-align: center; margin: 0;">Households that would use all forms of care</p> $\Pr(Y_{it} = j v_{1m}, v_{2kt})^A = \frac{e^{\beta_j x_{it} + \rho_{j1} v_{1m} + \rho_{j2} v_{2kt}}}{1 + \sum_{k=1}^5 e^{\beta_k x_{it} + \rho_{k1} v_{1m} + \rho_{k2} v_{2kt}}}$ $\Pr(Y_{it} = 0 v_{1m}, v_{2kt})^A = \frac{1}{1 + \sum_{k=1}^5 e^{\beta_k x_{it} + \rho_{k1} v_{1m} + \rho_{k2} v_{2kt}}}$ <p style="text-align: center;">(5.1)</p>	<p style="text-align: center; margin: 0;">Households that would not use formal care</p> $\Pr(Y_{it} = j v_{1m}, v_{2kt})^{NA} = \frac{e^{\beta_j x_{it} + \rho_{k1} v_{1m} + \rho_{k2} v_{2kt}}}{1 + \sum_{k=1}^3 e^{\beta_k x_{it} + \rho_{k1} v_{1m} + \rho_{k2} v_{2kt}}}$ $\Pr(Y_{it} = 0 v_{1m}, v_{2kt})^{NA} = \frac{1}{1 + \sum_{k=1}^3 e^{\beta_k x_{it} + \rho_{k1} v_{1m} + \rho_{k2} v_{2kt}}}$ <p style="text-align: center;">(5.2)</p>
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where $\Pr(Y_{it} = j | v_{1m}, v_{2kt})^A$ is the probability that household i (which has access to formal child care facilities) chooses state j at time t conditional on factors V_1 and V_2 , and $\Pr(Y_{it} = j | v_{1m}, v_{2kt})^{NA}$ is the probability for those households that prefer not to use formal care arrangements.

Conditional on the V 's, the likelihood contributions of the continuous outcome equations (2.2) are:

$$\Pr(H_i^1 | v_m) = \frac{1}{\sigma_{it}^1} \phi\left(\frac{H_i^1 - x_i^1 \alpha^1 - z_i^1 \gamma^1 - \tau_1 v_m}{\sigma_{it}^1}\right) \quad (6.1)$$

$$\Pr(H_i^2 | v_m) = \frac{1}{\sigma_{it}^2} \phi\left(\frac{H_i^2 - x_i^2 \alpha^2 - z_i^2 \gamma^2 - \zeta_1 v_m}{\sigma_{it}^2}\right) \quad (6.2)$$

where H_{it}^1 and H_{it}^2 are the dependent variables in the continuous outcome equations (2.2), ϕ is the probability density function of standard normal distribution, and σ_{it}^1 and σ_{it}^2 are the square roots of the variances of the error terms in equations (2.2).

Thus, the semi-parametric log-likelihood function for the system of equations (2.1-2.2) with the error structure (3.1-3.3) is:

$$\mathfrak{L} = \sum_{i=1}^N \ln\left(\sum_{m=1}^M P_m [\Pr(Y_i = j | v_m)^A \Pr(Y_i = j | v_m)^{NA} \Pr(H_i^1 | v_m) \Pr(H_i^2 | v_m)]\right), \quad (7)$$

where N is the number of households in the sample.

Choosing a priori numbers of points of support M , the log-likelihood function \mathcal{L} is maximized over α 's, β 's, γ 's, τ 's, ς 's, P 's, and v 's. For identification purposes, the two points of support are normalized to equal 0 and 1, respectively. The number of points of support is increased until the difference in the log-likelihoods of consequent maximizations satisfies the convergence criteria.

The joint distribution of the error terms (3.1-3.3) is unknown, so the sample statistics of the estimates cannot be derived analytically. It is feasible to estimate the covariance matrix Θ of the coefficients in the model (2.1-2.2) by inverting the Hessian matrix of the second derivatives of the log-likelihood function \mathcal{L} .

Dependent variables

The dependent variable for the discrete outcome equation is defined according to the possible combinations of a mother's employment status, employment status of other household members, and the mode of child care, which are shown in Table 2. These combinations are:

- (0) – the mother does not work and stays at home with her children;
- (1)– the mother does not work and children are in kindergarten;
- (2) – the mother works, the other household members also work, informal child care arrangements are used;
- (3) – the mother works, the other household members do not work, informal child care arrangements are used;
- (4) – the mother works, the other household members work, formal child care is used;
- (5)– the mother works, the other household members do not work, both formal and informal care arrangements are employed.

Table 7 shows the distribution of the dependent variables for continuous outcome equations, i.e., the time that mothers spent working and the time that children spent in formal care. Both continuous outcomes are observed only among the sample of working mothers or among the sample of children in formal care.

Explanatory variables

The definitions and descriptive statistics for the explanatory variables in the system of equations (2.1-2.2) are presented in Table 7. Several key variables of interest are discussed in detail below.

Price per quality unit of child care (P_q): We estimate the quality-adjusted price of outside-home care using the method suggested by Blau and Hagy (1998). RCCFS collected extensive information about the characteristics of the child care provided and the fees charged by creches and kindergartens. These data are used to estimate a model of fees for formal child care facilities. The quality-adjusted price of an hour of child care is determined by a location-specific hedonic price equation:

$$P_i = \pi_i + \beta x_i + \varepsilon_i$$

where P_i is the price of the formal care at location i , x_i is a vector of variables that represents the characteristics of the facility, β is a vector of coefficients, and ε_i is an error term. In that specification π_i can be interpreted as a market-specific quality adjusted hourly price of child care.

We use the quality-adjusted price of care to be able to compare the effects of price on household behavior for facilities that offer different quality of care. For example, suppose one facility offers several developmental programs and has a low teacher-child ratio. In other words, that facility provides a high quality of child care but charges a relatively high price for its services. The other institution does not offer such high quality of care, and the price it charges is low.

Directly comparing the prices of these two facilities is not possible because these prices are charged for different services. The methodology suggested above allows us to adjust prices for difference in the quality of provided care and thus makes these quality-adjusted prices comparable.

Mother's offered wage (W_m): The wage rates available to each mother have been imputed using Mincer's and Polachek (1974) type earning function regression with a control for selectivity (standard Heckman correction)² run on a subsample of working women for whom hourly wage data were available. The hourly wage has been calculated as a ratio of the women's monthly earnings and the total number of hours they worked during the month the survey was administered. In the absence of

² Regression coefficients for the wage equations are shown in Appendix 2. For identification in the selection equation, we use the standard set of household characteristics that can influence the mother's labor force participation decision but are uncorrelated with the potential wage rate.

data on the total amount of time a mother had worked during the preceding month, the imputations were made based on the number of hours worked during the week of the survey.

In the wage regression, the following explanatory variables have been used to predict mothers' experience, her marital status, and the amount of time she had been in her current main job. Imputations are made based on the women's predicted hourly wages, with the job tenure of nonworking mothers being equal to zero. Here the offered wage is assumed to be a wage that a mother could earn if she were to start a new job.

Offered wages of other household members (W_0): The wage rates available to other household members are calculated in a similar way to the wage rates available to mothers. Different regressions were run to predict wages for household members of different ages and genders. After the imputations, two methods were used to obtain the wage W_0 . Under the first specification the offered wage of other household members is equal to the lowest wage earned by any household member except the mother. The second specification uses the average wage of all working household members as an explanatory variable in the model.

Nonwage household income (E): Nonwage income is measured as household monthly income from all sources other than wage income. This may include social security transfers, private transfers, in-kind income, and income from home production. The structure of household income changed over the rounds of the survey, and certain adjustments were made to ensure compatibility of the income data across all of the survey rounds.

Other explanatory variables include some individual characteristics of the mother such as her age and level of education, household demographics and size, the number of children in the household and their ages, the number of pensioners in the household, and the household's geographical characteristics.

6. Results

The results of the estimation of the system of simultaneous equations (2.1-2.2) are shown in Table 8(a) for the discrete outcome equation and Table 8(b) for the continuous outcome equations.

Estimated coefficients

The estimated coefficients of the household child care/labor supply equation confirm the predictions of the theoretical model. An increase in the price of the unit quality of child care decreases the probability for the household to chose paid care (modes 1,4, 5) and increases the probability of choosing the states where children stay home. The change in the child care prices has the strongest and statistically most significant effect on the state where the mother does not work and children are in formal care (mode 1).

An increase in potential market wages of the mother increases the likelihood that the mother will participate in the labor market. The coefficient on the log of the mother's wage is positive for all states where the mother works, and it is statistically significant for modes 3, 4, and 5. Younger mothers are more likely to work and children of younger mothers are more likely to be in formal care. Relative to mothers with only primary education, mothers with higher levels of education are less likely to work and to have their children in kindergartens or crèches. Households may prefer that the mother stays home with children as higher-educated mothers can provide a higher quality of care for their children.

Households in the rural areas of Romania are less likely to use formal child care, and the probability of using kindergartens and crèches declines when the distance from the facility is greater than a 20-minute walk.

The results of the estimation of the continuous outcome equations of the mother's hours at work and the hours children spent in the child care facilities are presented in Table 8(b). The coefficients of the hours of work equation show a positive, although insignificant, effect of the mother's wage rate on the number of hours the mother spent working. An increase in the wage rate of other household members decreases the mothers' hours at work, but mothers from the larger households work more. Mothers with higher work tenure also tend to work longer hours. Significant differences in the hours of work are observed among the different occupations, where women employed in industry and in education work longer hours than other women.

The estimation of the model of the hours that children spent in kindergarten is consistent with the theoretical prediction results although the explanatory power of the model is weak: higher wages of the mother increases the number of hours children spend in care and an increase in the price of care

has a negative effect on the hours. As the assumption of exogenous prices for child care tends to underestimate this effect, the latter may be regarded as a minimum estimate, however.

Simulations

To examine the effects of policy instruments on household behavior, we simulate how households would respond to changes in the specific parameters used in the model. In a given simulation, a certain value of the variable of interest is assigned to all the households in the sample. The simulated probabilities for the discrete model outcomes and simulations for the continuous models are generated for each household at every point in time by integrating over the estimated heterogeneity distribution and averaging the probabilities across the sample. Next, the value of the variable of interest is changed, and this changed value is assigned to the whole sample of the households. Then the new set of simulated probabilities is generated. The effect of the changes in the particular parameter is calculated as a difference in these simulated probabilities.

The simulated distributions of the probabilities for the discrete outcomes are shown in Table 9. A 10 percent increase in the mother's potential wage increases the rate of maternal employment. For both states where the mother does not work (states 0 and 1, i.e. children at home or in child care), we observe a decline. The decrease is stronger in the state where the mother does not work and stays home with children (state 0). The number of households in this category drops by 7.2 percent as a result of an increase in mothers' wage. Under this new policy households would also be more likely to choose states that employ formal care arrangements. The proportion of households with working mothers that would use formal care increases by 8 percent. The total effect of the change in the wage rate is a 10.9 percent increase in the rate of women's labor force participation together with a 4.3 percent increase in the use of formal child care facilities.

Changes in the price of child care would have a smaller effect on the level of maternal employment and on the use of formal care. The simulated increase in the price of care by 10 percent would result in a 1.2 percent decline in the number of working mothers and a 2 percent decrease in the number of households that use crèches or kindergartens. Thus, a policy that fully subsidized formally provided child care could increase the rate of women's labor force participation by as much as 12-15 percent.

A 10 percent increase in the potential market wage of household members other than the mother would not have a significant effect on the household choice of child care mode or the mother's labor supply. As already discussed, these should be regarded as minimal estimates due to the exogeneity assumption. We also fail to discover any significant effect of the changes in household nonwage income on household behavior. This result seems to be consistent with the findings in other transitional economies (Lokshin 1999).

The Romanian results confirm those found in other countries. Table 10 presents estimated elasticities of female labor force participation and use of formal care for studies conducted in the United States, Brazil, Russia, and Romania. Among all these studies, Romanian results show the lowest response of women's labor force participation to a change in the price of child care. However, the elasticity of the use of formal care is found to be highest in Romania, indicating that child care prices play a strong role in households' decisions about the use of formal care.

This comparatively high elasticity of the household demand for child care with respect to child care costs may be attributed to the fact that a significant proportion of the households where mother is not working also use child care facilities. For households with working mothers child care costs may be seen as a fixed cost of maternal employment, i.e., for every hour the mother works she has to pay for the cost of care. In these cases household decide to use child care facilities as a substitute for the maternal care when the mother is at work. Any changes in the modes of care (for example a switch from kindergarten to home care) in response an increase in child care prices may lead to substantial changes in the labor supply of the household members and even to mother's exit from the labor market. In households where the mother does not work but the child is in formal child care, on the other hand, the decision not to use child care facilities would not have such a dramatic effect. Switching from paid care to home care may affect developmental outcomes for the children and mother's leisure time, but the impact on the household income is likely to be insignificant.

The low elasticity of female labor supply with respect to child care costs may be explained by the fact the child care is subsidized for the poorest household in Romania. Child care costs can be thought of as a fixed cost of maternal employment. For every hour the mother spends in the labor market she has to pay a cost of children care, which decreases her effective wage. In the better-off households the wages earned by the mother may be significantly higher than her reservation wage, when she would leave the labor market. Thus change in the cost of care would not decrease the

mother's effective wage below her reservation wage in better-off households, but in poorer households, and households where the mother's education and labor market experience is low, the situation is different. The potential market wages of the mother can earn on the market are not much higher than her reservation wages. An increase in the cost of care could therefore lead the mother to leave the labor market and stay home with the child. At present, however, the Romanian government subsidizes child care for and such policies buffer the impact of the changes in care prices on the poorest households. If the subsidy were removed maternal employment may be expected to decline, especially for young women and women with low education, little labor market experience.

Distributional impact of changes in price of child care and changes in mothers' wage rate

In the previous sections we showed the effects of various policy instruments on household behavior. An important issue in implementing a particular policy measure is the distributional impact of the policy. Changes in the price of child care or the mothers' wage rate may improve the well-being of households with small children, but these policies can affect households with different levels of income differently.

Figure 1 presents a non-parametric estimation³ of the effect of a 10 percent decrease in the price of child care on the mother's probability of being employed by per capita household income. The figure indicates that the policies that decrease the costs of care are most effective for households with above-average incomes. The elasticity of the change in the wage rate is about 0.11 for the poorest Romanian households and reaches 0.19 for households with per capita income around 900,000 lei per month (a 60 percent difference). The weak responsiveness of low-income households to the change in child care price could be explained in part by the above-mentioned differences in fees for households with different incomes. Poor households pay only 50 percent of child care facility fees, and the effect of changes in fees would accordingly be smaller for them.

A somewhat different picture is shown in Figure 2, which presents a non-parametric estimation of the distributional impact of a 10 percent increase in the maternal wage on the mother's probability of being employed. This policy is more effective for families with lower incomes. The effect of an

³ For the graphs we used the program for locally-weighted smoothed scatter plots.

increase in mothers' wages is almost twice as high for the poorest households than for households from the right side of income distribution. As a policy instrument that seeks to increase the maternal labor force participation of low-income families, an increase in wage rates appears preferable to a decrease in the price of child care.

7. Conclusions

This study estimates the effects of child care costs on the labor decisions of women in Romania. The estimation of the joint model of households' child care choices, mothers' labor supply decisions, and household demand for formal child care confirms the predictions of the theoretical model developed in this paper. The estimation indicates that economic incentives have a powerful effect on the work behavior of women with children in Romania. The level of wages available to them and the costs of child care can both be expected to affect women's labor force participation and labor supply decisions. Child care costs affect which child care arrangement households choose. When the costs of formal care are high, this discourages households from using formal child care and increases the number of households that rely on informal care. These findings match the subjective perceptions of Romanian women that high child care costs and low availability are barriers to women's employment.

Government subsidies for child care may increase the number of mothers who work, thus increasing the incomes of poor households and lifting some families out of poverty. The simulations in this paper show that measures such as subsidies aimed at reducing the costs of market child care are effective in increasing the number of mothers who work and the number of hours that they work. However, the effect of such policies on the poorest households in Romania is less significant.

In Romania formal child care plays the important additional role of providing pre-school education for children, regardless of the mother's labor market participation. While non-working mothers are more likely to keep their children in home care than working mothers, close to half of the children attending formal care have mothers who do not work. Further analysis is needed to determine whether this is a factor of the age of the child, with very young children being kept at home, and older children sent to formal care for the social and educational benefits provided by formal child care. The nature and extent of these benefits will need to be assessed in order to determine how kindergartens and creches can best prepare and equip Romanian children for their formal education. Further research

is also needed to determine the roles of the public and the private sector in the provision, finance and regulation of such services for both working and non-working mothers.

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Table 1: Utilization of state-provided child care facilities

	Full-week program	Full-day program	Part-day program
Occupancy rate (%)	82.7	80.6	86.4
Percent of facilities providing service	14.2	55.1	63.6

Source: RCCFS 1999.

Table 2: Household child care arrangements

	Working mother	Non-working mother	Both
Child at home	13.9 (110)	35.6 (283)	49.5 (393)
Child in child care	23.4 (186)	27.3 (217)	50.7 (403)
All	37.3 (296)	62.9 (500)	100 (796)

Table 3: Child care arrangements of working mothers

	Others work	Others don't work	Both
Child at home	31.0 (92)	6.1 (18)	37.1 (110)
Child in child care	50.9 (151)	12.0 (35)	62.9 (186)
All	81.9 (243)	18.1 (52)	100 (296)

Table 4: Household child care arrangements by number of children

# of children 0-6 years old	Mother working		Mother at home		All		Total
	Formal care	Home care	Formal care	Home care	Formal care	Home care	
1	21.3 (170)	12.8 (102)	19.1 (152)	28.5 (227)	40.5 (322)	41.3 (329)	81.7 (651)
2	2.01 (16)	1.0 (8)	7.8 (62)	6.28 (50)	9.8 (78)	7.3 (58)	17.9 (136)
3	0.0 (0)	0.0 (0)	0.5 (4)	0.6 (5)	0.5 (4)	0.6(5)	1.1 (9)
4+	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
All	23.3 (186)	13.8 (110)	27.3 (218)	35.4 (282)	50.8 (404)	49.2 (392)	100.0 (796)

Table 5: Mothers' labor force participation by household size

Household size	Percent of households	Percent of households with working mothers
2	1.6	41.7
3	35.9	43.4
4	33.7	37.4
5	26.7	32.1
6	8.3	28.8
7	6.9	21.8
Total	100.0	

*Source: RCCES**Table 6: Mothers' labor force participation by number of children in the household*

Number of children	Percent of households	Percent of households with working mothers
1	50.5	41.8
2	37.3	34.7
3	7.2	29.8
4+	5.0	20.0
Total	100.0	

Source: RCCES

Table 7: Summary statistics for the explanatory variables, the means and standard deviation.

	Mean	Std. error
Log of mother's wage	6.62	0.17
Log of wage of other household members	6.30	1.76
Mother's age	29.49	5.80
University degree	11.05	
Technical/vocational education	20.10	
Primary education	68.84	
<i>Household characteristics</i>		
Total household nonwage income	382.74	563.46
Number of children	1.72	3.77
Number of pensioners	0.15	0.45
Household size	4.16	1.36
Rural regions	50.25	
Town 10,000– 50,000	14.94	
Town 50,000–200,000	11.30	
Distance to facility: 10-20 minutes walk	34.43	47.54
Distance to facility: More than 20 minutes walk	17.21	0.37
<i>Geographic area</i>		
Transilvania	30.78	
Muntenia	31.41	
Moldova	19.72	
Bucharest	18.09	
<i>Mother's occupation</i>		
Agriculture	3.39	
Industry	25.24	
Construction	2.91	
Trade	19.90	
Health	8.25	
Education	15.04	
Banking	2.43	
Other	22.81	
Mother's tenure in months	84.39	64.31

Table 8(a): Semi-parametric estimation of the discrete outcome model of household child care choice and women's labor supply

	Mother works									
	Mother does not work, children in formal care		Children at home				Children in formal care			
			Other household members do not work		Other household members work		Other household members do not work		Other household members work	
	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error
Log average price of child care ¹⁾	-11.38**	3.98	6.37	5.41	13.26	14.36	0.58	0.51	-12.61	9.41
Log of mother's wage	9.30	6.83	37.32	35.29	76.26*	54.11	59.56**	31.02	95.26**	40.42
Log of other household members	-0.88	0.84	5.62	4.88	-2.17	1.36	1.01	1.18	-4.01***	1.09
Mother's age	3.73*	2.13	3.56	2.79	2.72	4.45	10.48***	3.14	9.90	4.67
Mother's age squared	-4.88*	2.93	-4.82	3.84	-2.45	5.90	-14.68***	4.51	-14.76**	3.52
University degree	-1.29**	0.63	-0.81*	0.46	-2.36**	0.86	-1.54**	0.60	-2.23**	0.88
Technical/vocational education	-0.27	0.25	-0.07	0.34	1.44*	0.71	-0.85**	0.40	1.13*	0.54
Primary education										Reference
<i>Household characteristics</i>										
Total household non-wage income	-4.56*	2.85	-0.94	2.30	-5.05	3.44	-4.49*	2.72	2.09	3.06
Number of children	-1.28	1.56	-8.74***	2.35	-1.76	7.42	-8.28**	2.40	1.37	3.05
Number of pensioners	3.66	2.40	-3.23	3.59	20.46**	7.78	0.35	3.19	6.70	2.75
Household size	1.94	1.24	4.15**	1.49	-9.82	6.22	1.84	1.69	-2.08	2.49
Rural regions						Reference				
Town 10,000– 50,000	-0.68**	0.34	0.37	0.37	0.16	0.96	0.45	0.35	-0.31	0.75
Town 50,000–200,000	-0.95**	0.41	0.30	0.38	1.23	0.79	-0.49	0.42	-0.59	0.79
10-20 minutes walk	-0.48*	0.23	-0.25	0.33	0.72	0.73	0.12	0.29	1.10*	0.52
More than 20 minutes walk	-0.52	0.30	0.30	0.35	1.36*	0.77	-0.02	0.37	-1.04	1.14
Transilvania	-0.02	0.33	0.63	0.38	0.15	0.81	0.70	0.40	2.64**	1.25
Muntenia	-0.04	0.33	0.03	0.40	-0.18	0.84	1.04**	0.40	3.52**	1.25
Moldova	0.55*	0.34	0.02	0.44	-0.37	1.02	0.67	0.42	3.61**	1.26
Bucharest						Reference				
Constant	-6.70	5.27	-3.94***	0.42	-6.08***	0.54	-5.87***	0.80	-7.56***	0.81

¹⁾ All variables are normalized to be in [0,1] range

Note: The mode where mother does not work and children stay home is used as a reference; * is significant at 10% level; ** at 5% level; *** at 1%.

Table 8(b): Semi-parametric estimation of the continuous outcome equations of the mother's work hours and the hours children spend at child care facility.

	Hours of work		Hours in formal care	
	Coefficient	Std. Error	Coefficient	Std. error
Log average price of child care¹⁾	6.87	9.04	-53.88	36.71
Log of mother's wage	11.25	19.62	19.72	76.63
Log of other household members	-3.90**	1.67	4.34	6.83
Mother's age	1.77	3.03	1.61	12.38
Mother's age squared	-0.03	0.04	-0.03	0.18
University degree				
Technical/vocational education	-6.34	5.90	7.43	24.18
Primary education		Reference		
<i>Household characteristics</i>				
Total household nonwage income	-0.01	0.00	-0.01	0.02
Number of children	-5.43	3.81	43.23**	15.50
Number of pensioners	-2.48	5.55	27.55	22.71
Household size	4.90*	2.77	4.56	11.39
Rural regions		Reference		
Town 10,000– 50,000	7.23	6.98	20.03	28.17
Town 50,000–200,000	1.30	7.82	29.83	31.79
10-20 minutes walk	1.82	5.27	2.93	21.53
More than 20 minutes walk	0.74	6.63	-4.08	26.97
Transilvania	5.57	7.62	5.26	30.55
Muntenia	3.01	7.59	18.78	30.84
Moldova	-6.07	7.85	37.79	31.96
Bucharest		Reference		
<i>Mother's occupations</i>				
Agriculture	15.57	18.22	X	
Industry	46.37***	8.47	X	
Construction	35.60**	18.93	X	
Trade	30.78***	7.60	X	
Health	23.73**	12.25	X	
Education	47.54***	10.80	X	
Banking	21.22	17.75	X	
Other		Reference		
Mother's tenure in months	0.44***	0.05	X	
Constant	-105.55	124.16	80.26	476.43

¹⁾ All variables are normalized to be in [0,1] range

Note: * is significant at 10% level; ** is significant at 5% level; *** is significant at 1% level.

Table 9: Simulation of the effects of various policies on the household choices of child care mode and mother's labor supply (proportion of households in each state)

	Mother does not work		Mother works			
	Children home	Children in formal care	Children home	Children in formal care		
	(State 0)	(State 1)	Other household members do not work (State 2)	Other household members work (State 3)	Other household members do not work (State 4)	Other household members work (State 5)
<i>Increase in mothers' wage rate by 10%</i>						
Sample average	0.378	0.267	0.131	0.022	0.158	0.044
Sample average+10%	0.306	0.230	0.148	0.033	0.207	0.075
Change (%)	-7.193	-3.696	1.744	1.115	4.961	3.068
<i>Increase in child care price by 10%</i>						
Sample average	0.375	0.261	0.128	0.020	0.174	0.042
Sample average+10%	0.395	0.258	0.117	0.018	0.177	0.036
Change (%)	1.998	-0.301	-1.102	-0.250	0.300	-0.646
<i>Increase in other household members wage by 10%</i>						
Sample average	0.382	0.272	0.114	0.020	0.178	0.033
Sample average+10%	0.381	0.270	0.120	0.020	0.179	0.032
Change (%)	-0.138	-0.275	0.527	-0.051	0.059	-0.121
<i>Increase in household non-wage income by 10%</i>						
Sample average	0.374	0.264	0.128	0.022	0.172	0.041
Sample average+10%	0.376	0.262	0.129	0.021	0.170	0.041
Change (%)	0.269	-0.232	0.059	-0.023	-0.131	0.059

Table 10: Comparison of the elasticities of the effect of child care cost on labor supply

Study (year)	Data	Estimated elasticities (increase in child care cost)	
		Labor force participation	Use of formal care
This paper	Romania Child Care and Employment Survey	-0.17	-0.41
Lokshin (1999)	Russia Longitudinal Monitoring Survey	-0.19	-0.11
Cleveland, Morley, Hyatt, (1996)	Canadian National Child Care Survey	-0.39	-0.2
Connelly (1992)	Panel of Survey of Income and Program Participation 1984, USA	-0.20	Not available
Blau and Robins (1988)	1980 Baseline Household Survey of Employment Opportunity Pilot Project, USA	-0.38	Not available

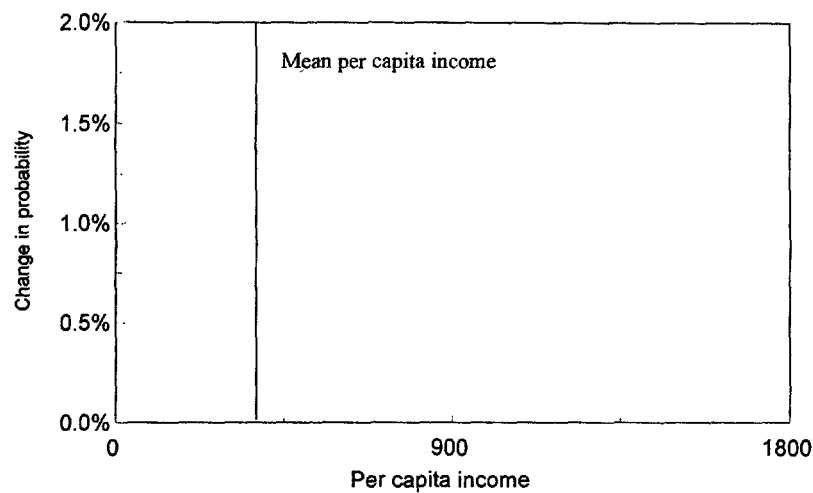


Figure 1: Non-parametric estimation of the distributional impact of a 10 percent decrease in the price of child care on the mother's probability of being employed, by per capita income

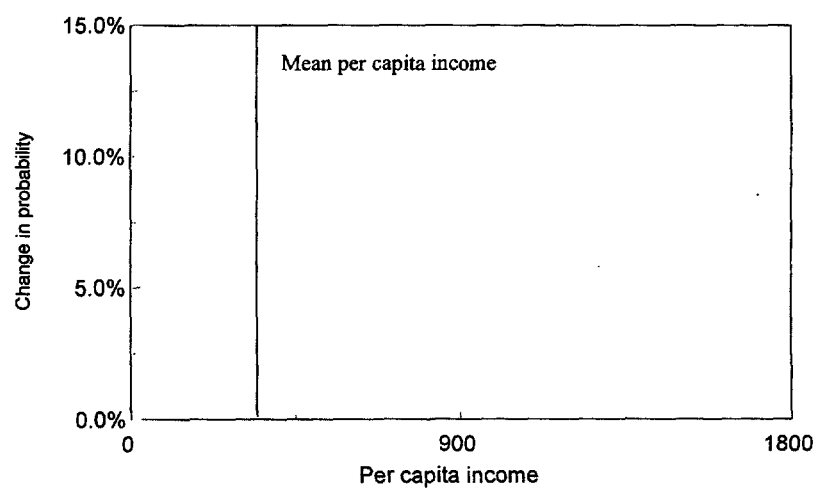


Figure 2: Non-parametric estimation of the distributional impact of a 10 percent increase in mothers' wage rates on the mother's probability of being employed, by per capita income

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